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For: MULTI-FUNCTIONAL POWER SUPPLY FOR A HALL THRUSTER

1 1. A multi-functional power supply system for a Hall thruster comprising:
2 a thruster assembly for providing a plasma discharge;
3 a cathode assembly for providing electrons, the cathode assembly
4 having an emitter, a keeper including a current limiting device, and a heater;
5 a magnetic field source operatively associated with the thruster
6 assembly for generating a magnetic field to control the discharge;
7 a plasma discharge circuit for creating a plasma and accelerating the
8 plasma to produce thrust; and
9 a power supply, connected to said keeper and said plasma discharge
10 circuit and connected to said heater through a switching device, responsive to a
11 predetermined condition for interrupting the power to said heater and simultaneously
12 enabling said power supply to deliver power to said keeper and said plasma discharge
13 circuit to initiate production of thrust.

1 2. The multi-functional power supply system of claim 1 in which said
2 magnetic field source is in series with said discharge circuit and powered by said power
3 supply.

1 3. The multi-functional power supply system of claim 1 in which said thruster
2 assembly includes an anode and is in series with said magnetic field source.

1 4. The multi-functional power supply system of claim 1 in which said
2 magnetic field source includes permanent magnets.

1 5. The multi-functional power supply system of claim 1 in which said system
2 includes a monitoring system for activating said switching device when said
3 predetermined condition occurs.

1 6. The multi-functional power supply system of claim 5 in which said
2 predetermined condition is temperature and said monitoring system includes a temperature
3 sensor.

1 7. The multi-functional power supply system of claim 5 in which said
2 predetermined condition is time and said monitoring system includes a timing circuit.

1 8. The multi-functional power supply system of claim 5 in which said
2 predetermined condition is voltage and said monitoring system includes a voltage sensor.

1 9. The multi-functional power supply system of claim 1 in which said power
2 supply operates in a current control mode when said switching device is closed and
3 conducting current to said heater and in a voltage control mode when said switching
4 device is open and interrupting the current to said heater.

1 10. The multi-functional power supply system of claim 1 in which said current

2 limiting device includes a resistor for selecting the operating point for said keeper.

1 11. The multi-functional power supply system of claim 1 in which said current
2 limiting device is non-dissipative.

1 12. The multi-functional power supply system of claim 1 in which said current
2 limiting device includes a second switching device for interrupting current to said keeper.

1 13. The multi-functional power supply system of claim 1 further including a
2 switching device for regulating current through the magnetic field source for regulating
3 plasma discharge impedance.

1 14. A multi-functional power supply system for a Hall thruster comprising:
2 a thruster assembly including an anode for providing a plasma
3 discharge;
4 a cathode assembly for providing electrons, the cathode assembly
5 having an emitter, a keeper including a current limiting device, and a heater;
6 a magnetic field source operatively associated with the thruster
7 assembly for generating a magnetic field to control the discharge;
8 a plasma discharge circuit for creating a plasma and accelerating the
9 plasma to produce thrust; and
10 a power supply connected to said keeper and said plasma discharge
11 circuit and connected to said heater through a switching device responsive to a
12 predetermined condition for interrupting the power to said heater and simultaneously
13 enabling said power supply to deliver power to said keeper and said discharge circuit to
14 initiate production of thrust, said power supply operating in a current control mode when
15 said switching device is conducting current and in a voltage control mode when said
16 switching device has interrupted the current to said heater.

1 15. A multi-functional power supply system for a Hall thruster comprising:
2 a thruster assembly for providing a plasma discharge;
3 a cathode assembly for providing electrons, the cathode assembly
4 having an emitter, a keeper including a current limiting device and a heater, said current
5 limiting device configured to select the operating point of said keeper;
6 a magnetic field source operatively associated with the thruster
7 assembly for generating a magnetic field to control the discharge;
8 a plasma discharge circuit for creating a plasma and accelerating the
9 plasma to produce thrust; and
10 a power supply connected to said keeper and said plasma discharge
11 circuit and connected to said heater through a first switching device responsive to a
12 predetermined condition for interrupting the power to said heater and simultaneously
13 enabling said power supply to deliver power to said keeper and said plasma discharge
14 circuit to initiate production of thrust.

1 16. The multi-functional power supply system for a Hall thruster of claim 15 in
2 which said current limiting device includes a second switching device configured to
3 interrupt the current to said keeper.

1 17. The multi-functional power supply system for a Hall thruster of claim 15 in
2 which said current limiting device includes a resistor configured to select said operating
3 point of said keeper.

1 18. The multi-functional power supply system of claim 15 in which said
2 current limiting device is non-dissipative.

1 19. A multi-functional power supply system for a Hall thruster comprising:
2 a thruster assembly including an anode for providing a plasma
3 discharge;
4 a cathode assembly for providing electrons, the cathode assembly
5 having an emitter, a keeper including a current limiting device, and a heater;
6 a magnetic field source operatively associated with the thruster
7 assembly for generating a magnetic field to control the discharge;
8 a plasma discharge circuit for creating a plasma and accelerating the
9 plasma to produce thrust; and
10 a power supply, connected to said keeper and said plasma discharge
11 circuit and connected to said heater through a switching device, responsive to a
12 predetermined condition for interrupting the power to said heater and simultaneously
13 enabling said power supply to deliver power to said keeper, said plasma discharge circuit,
14 said magnetic field source and said thruster assembly to initiate production of thrust.